What is claimed is:

1. A multi-layer insulation blanket attachable to a spacecraft, said multi-layer insulation blanket comprising:

an outer sheet of thermally insulative plastic material, said outer sheet having a reflective surface on a side of said outer sheet of thermally insulative plastic material facing space when said multi-layer insulation blanket is attached to the spacecraft;

at least one inner sheet of thermally insulative plastic material between said outer sheet of thermally insulative plastic material and the spacecraft when said multi-layer insulation blanket is attached to the spacecraft; and

a coating of anti-contaminant material overlying said reflective surface of said outer sheet of thermally insulative plastic material, said coating of anti-contaminant material being effective to induce the breakdown of organic residues on said outer surface of said outer sheet of thermally insulative plastic material in the presence of solar radiation.

2. The multi-layer insulation blanket of Claim 1 wherein said outer sheet of thermally insulative plastic material comprises metallized polyimide material or metallized polyester material.

3. The multi-layer insulation blanket of Claim 1 wherein said at least one inner sheet of thermally insulative plastic material comprises polyimide material or polyester material.

4. The multi-layer insulation blanket of Claim 1 wherein said at least one inner sheet of thermally insulative plastic material is metallized.

5. The multi-layer insulation blanket of Claim 1 wherein said outer sheet of thermally insulative plastic material and said at least one inner sheet of thermally insulative plastic material are coextensive with one another.

6. The multi-layer insulation blanket of Claim 1 wherein said anti-contaminant material comprises a photocatalytic material.

7. The multi-layer insulation blanket of Claim 6 wherein said photocatalytic material comprises a photoactive transition metal oxide.

8. The multi-layer insulation blanket of Claim 7 wherein said photoactive transition metal oxide is selected from the group consisting of TiO_2, ZnO, WO_3, $CaTiO_3$, SnO_2, MoO_3, NbO_5, Fe_2O_3, Ta_2O_5, and $Ti_X(Zr_{1-X})O_2$, where X has a value of between 0 and 1.

9. The multi-layer insulation blanket of Claim 1 further comprising at least one layer of lightweight spacing material disposed between said outer sheet of thermally insulative plastic material and said at least one inner sheet of thermally insulative plastic material.

10. The multi-layer insulation blanket of Claim 9 wherein said lightweight spacing material comprises nylon mesh or glass fiber mesh..

11. The multi-layer insulation blanket of Claim 1 further comprising a high emittance layer between said reflective surface and said coating of anti-contaminant material.

12. The multi-layer insulation blanket of Claim 11 wherein said high emittance layer comprises a material selected from the group consisting of glass, quartz, silicon nitride, and silicon oxy-nitride.

13. The multi-layer insulation blanket of Claim 11 further comprising an electrically conductive layer, wherein said electrically conductive layer overlies said coating of anti-contaminant material or is between said coating of anti-contaminant material and said high emittance layer.

14. The multi-layer insulation blanket of Claim 13 wherein said electrically conductive layer comprises one of indium tin oxide and indium oxide.

15. A multi-layer insulation blanket attachable on a structure intended for use in vacuum conditions, said multi-layer insulation blanket comprising:

an outer sheet of thermally insulative plastic material, said outer sheet having a reflective surface on at least a first side thereof facing away from said structure when said multi-layer insulation blanket is attached to the structure;

at least one inner sheet of thermally insulative plastic material between said outer sheet and the structure when said multi-layer insulation blanket is attached to the structure;

a high emittance layer overlying said reflective surface of said outer sheet of thermally insulative plastic material; and

a coating of photocatalytic material overlying said high emittance layer, wherein said coating of photocatalytic material catalyzes the breakdown of organic residues on said outer surface of said outer sheet of thermally insulative plastic material when exposed to at least one of ultraviolet and near-ultraviolet radiation.

16. The multi-layer insulation blanket of Claim 15 wherein said outer sheet of thermally insulative plastic material comprises metallized polyimide material or metallized polyester material.

17. The multi-layer insulation blanket of Claim 15 wherein said at least one inner sheet of thermally insulative plastic material comprises polyimide material or polyester material.

18. The multi-layer insulation blanket of Claim 15 wherein said at least one inner sheet of thermally insulative plastic material is metallized.

19. The multi-layer insulation blanket of Claim 15 wherein said outer sheet of thermally insulative plastic material and said at least one inner sheet of thermally insulative plastic material are coextensive with one another.

20. The multi-layer insulation blanket of Claim 15 wherein said photocatalytic material comprises a photoactive transition metal oxide.

21. The multi-layer insulation blanket of Claim 20 wherein said photoactive transition metal oxide is selected from the group consisting of TiO_2, ZnO, WO_3, $CaTiO_3$, SnO_2, MoO_3, NbO_5, Fe_2O_3, Ta_2O_5, and $Ti_X(Zr_{1-X})O_2$, where X has a value of between 0 and 1.

22. The multi-layer insulation blanket of Claim 15 further comprising at least one layer of lightweight spacing material disposed between said outer sheet of thermally insulative plastic material and said at least one inner sheet of thermally insulative plastic material.

23. The multi-layer insulation blanket of Claim 22 wherein said lightweight spacing material comprises nylon mesh or glass fiber mesh.

24. The multi-layer insulation blanket of Claim 15 wherein said high emittance layer comprises a material selected from the group consisting of glass, quartz, silicon nitride, and silicon oxy-nitride.

25. The multi-layer insulation blanket of Claim 15 further comprising an electrically conductive layer, wherein said electrically conductive layer overlies said coating of anti-contaminant material or is between said coating of anti-contaminant material and said high emittance layer.

26. The multi-layer insulation blanket of Claim 25 wherein said electrically conductive layer comprises one of indium tin oxide and indium oxide.

27. The multi-layer insulation blanket of Claim 15 wherein the structure comprises a spacecraft.

28. A method for inhibiting the formation of organic residues on the outer surface of a multi-layer insulation blanket attachable on a structure intended for use in vacuum conditions, said method comprising the steps of:

coating an outer surface of an outer layer of the multi-layer insulation blanket that faces away from the structure when the multi-layer insulation blanket is attached to the structure with a photocatalytic material; and

exposing the photocatalytic material coated outer surface of the outer layer of the multi-layer insulation blanket to at least one of ultraviolet radiation and near-ultraviolet radiation to activate the photocatalytic material to catalyze the breakdown of organic residues on the outer surface of the outer layer of the multi-layer insulation blanket.

29. The method of Claim 28 wherein in said step of coating, the photocatalytic material comprises a photoactive transition metal oxide.

30. The method of Claim 29 wherein in said step of coating, the photoactive transition metal oxide is selected from the group consisting of TiO_2, ZnO, WO_3, $CaTiO_3$, SnO_2, MoO_3, NbO_5, Fe_2O_3, Ta_2O_5, and $Ti_X(Zr_{1-X})O_2$, where X has a value of between 0 and 1.

31. The method of Claim 28 wherein in said step of coating, the photocatalytic material is applied in a layer having a thickness within a range of 2 nm to 200 nm.

32. The method of Claim 28 wherein the structure comprises a spacecraft, and wherein said step of exposing comprises exposing the spacecraft to solar radiation in space.

33. The method of Claim 28 wherein in said step of coating, the photocatalytic material is coated over a high emittance layer on the outer surface of the multi-layer insulation blanket.

34. The method of Claim 28 wherein in said step of coating, the photocatalytic material is coated over an electrically conductive layer overlying a high emittance layer on the outer surface of the multi-layer insulation blanket.